



# ICAO ENGINE nvPM EMISSIONS DATA SHEET

## SUBSONIC ENGINES

ENGINE IDENTIFICATION: Trent 1000-Q3 BYPASS RATIO (-): 8.9  
 UNIQUE ID NUMBER: 01P19RR117 PRESSURE RATIO  $\pi_{co}$  (-): 48.0  
 COMBUSTOR: Phase5 Tiled  
 ENGINE TYPE: TF RATED OUTPUT  $F_{oo}$  (kN): 350.9

### REGULATORY DATA

CHARACTERISTIC VALUES:	$LTO_{mass}/F_{oo}$ (mg/kN)	$LTO_{num}/F_{oo}$ (particles/kN)	NVPM MASS CONCENTRATION ( $\mu\text{g}/\text{m}^3$ )
$LTO/F_{oo}$ AND MAX $nvPM_{mass}$	181.3	1.65E+15	3410
AS % OF CAEP/10 LIMIT	-	-	89.2
AS % OF CAEP/11 LIMIT (InP)	52.2	39.7	
AS % OF CAEP/11 LIMIT (NT)	84.7	59.5	

### MEASURED DATA

MODE	POWER SETTING (% $F_{oo}$ )	TIME minutes	FUEL FLOW kg/s	EMISSIONS INDICES*		NVPM MASS CONCENTRATION PEAK $nvPM_{mass}$ ( $\mu\text{g}/\text{m}^3$ )
				$EI_{mass}$ (mg/kg)	$EI_{num}$ (particles/kg)	
TAKE-OFF	100	0.7	2.721	41.6	7.09E+13	
CLIMB OUT	85	2.2	2.217	65.3	2.18E+14	
APPROACH	30	4.0	0.719	80.9	8.85E+14	
IDLE	7	26.0	0.264	19.3	4.69E+14	
LTO TOTAL (kg, mg, number of particles)			991	45773	4.17E+17	-
NUMBER OF ENGINES				1	1	1
NUMBER OF TESTS				3	3	3
AVERAGE $LTO/F_{oo}$ VALUES (mg/kN, particles/kN)				130.4	1.19E+15	-
MAX EI VALUES (mg/kg, particles/kg) AND MAX MASS CONC. ( $\mu\text{g}/\text{m}^3$ )				153.7	9.72E+14	2649

\* Emissions Indices are corrected for thermophoretic loss and fuel hydrogen content

### DATA FOR EMISSIONS INVENTORIES (ESTIMATIONS FOR ENGINE EXIT PLANE VALUES)

MODE	POWER SETTING (% $F_{oo}$ )	CORRECTED EMISSIONS INDICES	
		$EI_{mass_{SL}}$ (mg/kg)	$EI_{num_{SL}}$ (particles/kg)
TAKE-OFF	100	44.5	9.54E+13
CLIMB OUT	85	70.4	3.03E+14
APPROACH	30	93.0	1.96E+15
IDLE	7	23.2	9.25E+14

### AMBIENT CONDITIONS

	From	To	FUEL	
BAROMETER (kPa)	100.8	101.6	HEAT OF COMBUSTION (MJ/kg)	43.34
TEMPERATURE (K)	287.0	292.6	HYDROGEN CONTENT (%mass)	13.97
HUMIDITY (kg water/kg dry air)	0.0080	0.0090	AROMATICS CONTENT (%vol)	15.9
			NAPHTHALENE CONTENT (%vol)	0.11
			SULPHUR CONTENT (ppm by mass)	300

MANUFACTURER: Rolls-Royce plc  
 TEST ORGANIZATION: Rolls-Royce plc  
 TEST LOCATION: Derby  
 TEST DATES: 04/10/2018

### REMARKS

1. Certification Report EDNS01000740804

\*\* DATA SUPERSEDED \*\*

SEE FOLLOWING UID FOR REVISED DATA:

02P23RR137